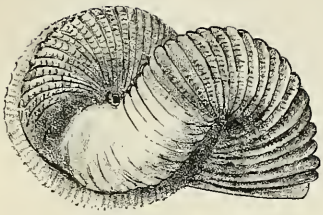

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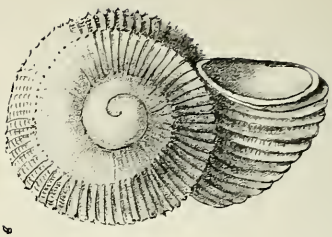

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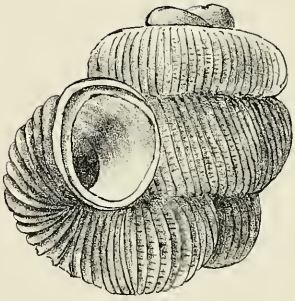

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OPISTHOSTOMA NILGIRICA

H.L.Frazer Lith. Calcutta

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Contributions to Indian Malacology, No. I.—By Messrs. W. T. *and* H. F. Blanford, *of the Geological Survey of India.*

In a paper published in the Annals and Magazine of Natural History for 1857,* Mr. W. H. Benson gave an able resumé of the distribution of the *Cyclostomaceæ* of South-western Asia and of some of the neighbouring islands. As regarded their distribution in India, both Cis and Trans-gangetic, it was proved that the evidence then available shewed a considerable generic distinction between the forms of the Indian peninsula with Ceylon on the one hand, and those occupying the Himalayas, the Khasi hills, Burmah, and the Malay countries on the other. It was also attempted to be shewn that, if two streams of distinct genera were supposed to extend from the island of Borneo, one might be imagined to pass up through the eastern, the other through the western peninsula, the valley of the Ganges and the plains of Northern India being the limit of each line.

At that time it was believed that no single species of land shell occurred at the same time upon the Himalayas, and in India south of the Ganges. A few widely disseminated species, such as *Helix vitrinoides*, are certainly to be found at the base of the mountains, as well as universally over the plains, but even at the foot of the Himalayas a great change takes place in the fauna generally, and when once fairly within the mountains, scarcely a species of the Indian plains recurs. But there are a few exceptions. In the Annals for April, 1859, Mr. Benson mentioned the discovery by one of ourselves of

* Ann. and Mag. of Nat. Hist. Vol. XIX. p. 201.

Helix castra, Benson, on the hills of Balasore in Northern Orissa, and more recently a single specimen of a shell perfectly undistinguishable from *Helix Huttoni*, Pfeiffer, has occurred to us on the northern flank of the Nilgiri mountains in Southern India.* Both of these species have a wide distribution; *H. castra* being known to range from Sikkim to the Tenasserim provinces, and *H. Huttoni* throughout the greater portion of the Himalayas. Indeed it is more than probable, from an examination of recently collected specimens of *H. tapeina*, Benson, that *H. Huttoni* is only a variety of that species, an identity which, if substantiated, will extend its range to the Khasi Hills and Burmah, where the variable but scarcely distinguishable *H. rotatoria*, V. d. Busch, replaces it, unless the latter also prove to be only a variety.

It is exceedingly probable that, as each region becomes more thoroughly searched, many other species will be found to have a far more extensive range than is at present supposed. The peninsula of India is, as a rule, extremely poor in land shells, and the conchologist may travel for miles over its plains without meeting with a single mollusk. The plains of Bengal, from a space as large as the British Isles, have scarcely furnished twenty species. On the contrary the Himalayas, especially their eastern portion, and the Burmese peninsula, appear to be extremely rich both in species and individuals, a circumstance doubtless intimately connected with the greater and more constant humidity of the climate. With a few exceptions, Cis-gangetic India has been fairly explored by conchologists, although it has not been thoroughly searched. Of Trans-gangetic India, nine-tenths are totally unexamined. At least half of the Himalayas have never been visited, and all that has been carefully explored consists of a considerable tract in the western Himalayas around Simla and Masúri, and the outer hills of Sikkim, from which we ourselves, but the other day, procured more than twenty undescribed forms. The Khasi Hills, a small tract of country, have been fairly examined, but the vast peninsula thence to Singapore has only been searched in the immediate neighbourhood of Molmain, whilst a few shells have been collected during hurried visits, or (the larger species

* Mr. Benson also informs us that he has received *H. fastigiata*, Hutt. from the Nilgiris.

especially) procured by accident from Pegu, Ava, the Tenasserim provinces, Penang, Malacca, Singapore and perhaps one or two other places. The greater portion of the mountains north of the Punjab, the vast tract of Nepal, the interior valleys of Sikkim, Bhotan, Assam with the mountains both north and south of it, Arracan, and, with the few exceptions mentioned, the Malay peninsula, are totally unsearched. Despite these circumstances, the list of shells described from the Himalayas and Burmah alone probably exceeds that from all the Indian peninsula.

But even India proper may yet yield important novelties. Perhaps no part has been more carefully or more repeatedly examined than the Nilgiri hills of Southern India. They are perhaps the last place whence generic forms new to the country might be expected, yet we have been so fortunate as to meet with such, among the smaller shells as might naturally be expected, but by no means amongst those least interesting.

Amongst the genera enumerated as characterizing India north of the Ganges and east of the Bay of Bengal, none perhaps is more generally distributed or more abundant than the singular little genus *Alycæus*, Gray. Another form which, however, perhaps chiefly on account of its minute size, has not as yet been shewn to have an equal range in these countries with *Alycæus*, but which also occurs in Mr. Benson's list of genera confined to the northern and eastern regions of India, is *Diplommatina*, Benson. The discovery of species of both of these genera, in a district so well examined previously as the Nilgiri hills have been, must make us pause before we conclude that we are in possession of data sufficient to enable us to come to definite conclusions upon the distribution of Indian land shells.

The circumstance of their discovery becomes less surprising when we consider that there are several species of shells on the Nilgiris closely representative of Himalayan and Burmese forms. Thus *Helix Cycloplax*, Benson, of Sikkim and *H. Oxytes*, B., of the Khasi hills are replaced by *H. Thyreus*, B.; *Achatina tenuispira*, B. of Sikkim, Khasi, Burmah, &c. by *A. Shiplayi*, Pfr.; *Bulimus vibex*, Hutt, and *B. cœlebs*, B. of the Western Himalaya by *B. Nilagiricus*, Pfr. &c.

To return to the genera of *Cyclostomaceæ;* there are to be found on the eastern side of the Bay of Bengal and in the Himalayas the

following genera which are absent on the western side of the Bay: *Megalomastoma*, *Pupina*, *Registoma*,* *Raphaulus*, *Streptaulus*, and *Hybocystis* (all of which are closely allied genera and of one type) *Hydrocena* and *Pomatias*, the last being probably only an outlier. In Ceylon there is one peculiar genus, *Aulopoma*, but it is evident that Ceylon is a generic area by itself. Lastly there are common to both sides of the Bay of Bengal or of the Ganges valley *Cyclophorus*, *Cyclotus*, *Pterocyclos*, *Leptopoma*, *Cataulus*,† *Alycæus* and *Diplommatina*. In the Indian peninsula, properly speaking, not one generic form exists, which is wanting in Trans-gangetic countries, with the exception perhaps of the little shell which we now describe under the name of *Opisthostoma*: but even assuming this genus to be decidedly operculate, it would be premature to assert that so minute a shell has no specific representative in the Himalayan or Burmese areas ‡ *Otopoma* only occurs in Katiwar, where the climate is different from that of India proper, and where all organic nature shews an intermixture of Indian forms with those of South-western Asia and of Africa.

We can therefore only conclude that scarcely sufficient is yet known to justify a decided opinion as to the distribution of the land shells of India and the adjoining countries. So far as the most recent discoveries enable us to form a judgment, we agree with Mr. Benson in considering that a generic distinction does exist between the two areas of Cis and Trans-gangetic India, but we doubt whether it is satisfactorily shewn that Borneo is the generic centre around which all the forms of South-western Asia and the Indian Archipelago are

* In the Nicobar Islands.

† One species in the Nicobar Islands.

‡ Since these remarks were written, Mr. Benson has described, in the Ann. and Mag. for Feb. 1860, two new genera of operculate land shells from Molmain, and has named them *Rhiostoma* and *Clostophis*. The former is allied to *Pterocyclos*, the latter is a minute form, probably allied to *Diplommatina* and *Opisthostoma*. Like the latter it is separated from the former on account of peculiarities in the last whorl, which, in *Clostophis*, is free and descending. It is possible that other species allied to these new forms may hereafter be discovered, and the two types be found to represent and replace each other in the Indian and Burmese areas.

grouped; or that the distinctions between the Indian areas are satisfactorily explained by considering them as "streams" of generic affinity radiating from that island. So far as our present knowledge extends we are inclined to look upon the distinction as consisting mainly in the more favorable conditions for land shells generally in the moist countries of the Himalayas and of the Burmese and Malay peninsula, in the absence of shells of the *Pupina* and *Megalomastoma* type in the Indian peninsula, (a circumstance doubtless connected with the greater dryness of the country) and in the existence of a generic centre in the island of Ceylon, characterized especially among the *Cyclostomaceæ* by forms of *Aulopoma* and *Cataulus*.

The shells described in the following pages were obtained in collections made by Mr. H. F. Blanford in 1857, and by Mr. W. T. Blanford during a short visit in 1859. A few other forms procured at the same time are also believed to be undescribed, but as they are of less interest, they must await further leisure.

Opisthostoma, gen. nov.

Testa operculata? Anfractibus apicialibus obliquiter deflectis, anfractu ultimo constricto, deinde inflato, denique sinistrorsim ascendente, anfractibus superioribus contiguo; aperturâ reversâ, rotundatâ, continuâ; peristomate duplicato.

1.—O. Nilgirica, n. s.

Testa minima, truncate pupiformis, auguste umbilicata; spirâ irregulari, apice obtusâ, obliquâ, suturâ profundâ; costulata, interspatiis minutissime decussatis, albida, translucens. Anfractus rotundati, 5, quorum duo primi obliquiter contorti; ultimus constrictus, deinde inflatus, refractus, ascendens, denique sinistrorsus, anfractum penultimum contingens. Apertura subobliqua, superne versata, orbicularis. Peristoma continuum, incrassatum, duplicatum.

Diam. maj.,..... 1.3 m. m.
Alt.,..... 1.1 m. m.

Habitat apud Pykara ad summos montes "Nilgiri" inter folia caduca humida sylvarum.

Of this remarkable little shell the first and only known specimens were found by one of us rather more than two years since in the dead leaves of one of the little thickets termed "sholas" near Pykara on

the Nilgiris. As all the specimens found were dead shells and it seemed most desirable to obtain living specimens in order to determine satisfactorily the nature of the species from an inspection of the animal, we have hitherto abstained from publishing a description which must of necessity be imperfect, in the hope, either that one of ourselves might revisit the hills and procure a supply of living specimens, or that some of our friends conchologically inclined, might aid us in the matter. We have, we regret to say, been disappointed in these expectations, and we therefore publish the description and figure of the shell, hoping that publicity may lead others to the search, and we leave the question of the nature of the animal and the existence of an operculum to be settled at some future period.

To the kind aid of Capt. Mitchell of Madras we are indebted for the accompanying figures, drawn with the aid of the camera lucida, and magnified about 30 diameters. The specimen from which the drawings are taken is in excellent preservation and shews very clearly not only the costulation, which bears a great resemblance to that of *Diplommatina* and *Alycæus*, but also a regular scalariform decussation of the interstitial spaces which is represented on an enlarged scale in figure 5. This costulation and more especially the *Alycæus*-like strangulation and inflation of the last whorl point to the probability of the present being an operculate genus, and the round whorls and continuous and duplicate peristome lead to the same conclusion. No trace of a tube is perceptible on any part of the shell.

From these characters we should infer that *Opisthostoma* holds an intermediate place between *Alycæus* and *Diplommatina*, resembling the former in the strangulation and distortion of the last whorl, the latter in the pupiform shape and in the rise of the last whorl upon the penultimate, and both in the duplication of the peristome, and in the regular costulate ornamentation: but the peculiar distortion of the apicial whorls and the hyperstomoid flexure of the last whorl are characters not hitherto found in any operculate genus, and having their analogues in *Streptaxis* and *Boysia* among inoperculate shells. Seeing, however, the great variation of spiral form that obtains in the different Cyclostomaceous genera, no great weight can, we think, be attached to spiral peculiarities when opposed to the evidence of the characters above enumerated which connect *Opisthos-*

toma with operculate forms, and until further evidence shall shew such a view to be untenable, we may regard the present as one more of the peculiar Cyclophoroid genera which seem specially to characterize the Indian and Bornean provinces.

2.—Alycæus Expatriatus, *n. s.*

Testa mediocriter umbilicata, depressa, ad anfractos internos obsolete, ad ultimum fortius, ad spatium inflatum valde, crebre costulata, corneo-albida, apice diaphane rubella; spira vix elevata, apice obtusa; sutura impressa; anfr. $3\frac{1}{2}$ convexi, ultimus ad latus mediocriter inflatus, deinde constrictus; constrictione longa, medio tumida, glabra; tubulum suturale pone constrictionem oriens, mediocriter longum, plerumque $\frac{1}{5}$ peripheriæ subæquans, sed nonnullis exemplis brevius; apertura circularis, obliqua, juxta anfr. penultimum retro curvatum; perist. duplex; internum breviter porrectum, continuum, externum expansum, interruptum, columellari margine strictum. Operculum corneum, distincte multispirum, anfr. 7-8 planulatis, externe perconcavum, nucleo centrali interno prominente papillari.

Diam. maj.	$4\frac{1}{2}$ m. m.
Ditto min.	$3\frac{3}{4}$ ditto.
Alt.	$2\frac{1}{2}$ ditto.
Apert. diam.	$1\frac{3}{4}$ ditto.

Hab. Haud raro ad Neddoowŭttom ghat, ad latus septentrionale montium "Nilgiri" Indiæ australis et circa 3000—4000 ped. alt.

This species appears to be more depressed in the spire than any other of the genus, except perhaps the Bornean *A. spiracellum*, A. Ad. and Reeve. Its nearest Indian ally is *A. strangulatus*, Hutton, and in size it is intermediate between that species and *A. stylifer*, Bens. It belongs to the section *Charax* of Benson, having a wide strangulation behind the peristome, crossed by a swollen ridge, which, however, in *A. expatriatus* never presents the sharpness so remarkable in *A. stylifer* and *hebes*, but is rather a broad tumid space separating two narrow constrictions. The sutural tube is variable in length, sometimes being nearly as short as in *A. strangulatus*, in other specimens as long as in *A. stylifer;* the latter being the usual case, the former the exception, but both occur in perfectly fresh and full grown specimens.

From *A. strangulatus*, the species is distinguished by its greater size, more depressed form, more oblique aperture, by the recurvation of the peristome at its junction with the penultimate whorl, the longer sutural tube, the greater distance of the ridge crossing the constriction from the mouth, and the closer sculpture. From *prosectus* and *stylifer*, the characters of the peristome, which is simple in *stylifer* and expanded at the columellar margin in *prosectus*, besides the smaller size of *A. expatriatus;* from *hebes* and *gemmula* the slightly prominent ridge not recurved and the depressed form afford abundant grounds for distinction. *A. spiracellum* of Borneo is probably closely allied, but we are only acquainted with that shell by its description. Judging therefrom *A. expatriatus* should be distinguished by its smaller size, more narrow umbilicus, greater bluntness of the ridge in the constriction, and in general by the greater length of the sutural tube, a character which, however, is evidently, from its variability in this species, of less value than has hitherto been supposed.

The species occurred near the base of Neddoowuttom ghat, and a little above the village of Goodaloor. The animal is small and colourless; the body very short; the sole undivided; tail short and rather pointed; tentacles short, yellowish; muzzle blunt, not elongated.

3.—Diplommatina Nilgirica, *n. s.*

Testa dextrorsa, imperforata, subovata, *glabra*, tenuis, nitida, cornea; spira conoidea, apice obtusa; anfr. 6 convexi, superne leniter crescentes, ultimus parum augustior, antice ascendens, carinâ costiformi circa umbilicum munitus; apertura subverticalis, circularis; perist. haud dentatum, duplex; externum breviter expansum, interruptum; internum mediocriter porrectum, continuum. Operc. corneum, subcirculare, ad suturam angulatum, planum, haud spiratum.

Long.	3 m. m.
Diam. max.,	$1\frac{1}{4}$ ditto.
Apert. diam.,	$\frac{3}{4}$ ditto.
Anfr. ultimi long.,	1 ditto.

Habitat in sylvis prope Pykara versus apices montium "Nilgiri" (ad alt. circa 7000 ped).

This species is distinguished from all others of the genus yet described by the ridge around the umbilicus, which is an exact coun-

terpart of that in the Sikkim shell, *Megalomastoma funiculatum*, B. The perfect smoothness of Dip. Nilgirica, and the continuity of the internal peristome, give it a sub-generic character, yet seem insufficient alone to authorize its separation from *Diplommatina*.

The animal could not be well observed for the want of a sufficiently powerful magnifier at hand. It was small, short, and colourless, with two small black tentacles.

4.—Cyclotus Malabaricus, *n. s.*

Testa subaperte umbilicata, depresso-conica, albida, glabra, nitidula, epidermide deciduâ corneâ, ad anfr. ultimum transverse fusco-strigatâ, induta; spira conica, apice acuta; sutura profunda; anfr. 4 rotundati, celeriter crescentes, ultimus cylindraceus; apertura parum obliqua, circularis, prope umbilicum parum sinuata, superne vix angulata; perist. duplex, externum brevissime expansum, internum porrectum, acutum, continuum; umbilicus perspectivus. Operculum haud immersum, duplex, internum corneum multispirum, externum testaceum, anfractuum marginibus lamella spirali, albidâ, scabrâ ad anfr. externos perelevatâ et versus centrum incurvatâ, quasi convexâ, munitis.

Diam. maj.,	$3\frac{1}{4}$ m. m.
Ditto min.,	$2\frac{3}{4}$ ditto.
Alt.,	$2\frac{1}{2}$ ditto.
Apert. diam.,	$1\frac{1}{6}$ ditto.

Hab. sub rupibus et saxis in terrâ humidâ ad margines sylvarum prope Pykara montium "Nilgiri," ad alt. 7000 ped.

Nearly allied to *Cyclotus filocinctus*, Benson, by the peculiarity of its operculum, this shell is distinguished by its smaller size, more depressed form, and less expanded peristome, by the absence of the marked sculpture of *C. filocinctus*, and by the epidermis being lighter in colour and marked by brown transverse streaks on the last whorl. That of *C. filocinctus* is hispid. The last named shell was first described by Mr. Benson as a *Cyclostoma*, to which genus it was assigned till lately. The construction of the operculum is very peculiar. The testaceous spiral lamina being very much more raised towards the exterior than towards the centre, and being curved inwards, the interior whorls of the operculum are almost concealed and the appearance, unless very closely examined, is that of the oper-

culum of a *Turbo* hollowed out at the centre. The lamella in *C Malabaricus* is rather more elevated than even in *C. filocinctus*.

The animal of *C. Malabaricus* we have not had an opportunity of observing, that of *C. filocinctus* belongs to the Cyclophoroid group,* the sole of the foot being undivided, the tentacles tapering, and the muzzle short and blunt. The foot is short, broad and rounded at the tail, the tentacles are black, rather short, and contractile, with the eyes at their base, the body is colourless, with the exception of black patches above the head and at the base of the tentacles.

C. filocinctus abounds on the N. side of the Nilgheris, but we have not met with it on the top of the hills. It is found chiefly in decaying leaves and moist earth beside rocks and stones. *C. Malabaricum* with *Dip. Nilgirica*, *Ennea Pirriei*, Pfr. and some minute Helices, occurred at the edges of the small patches of forest, known as "sholas," which abound in every small hollow in the hills, and are remarkable from the abruptness of their boundaries, a few feet leading from dense jungle to the open grassy hill side. Under the shrubs at the edges of sholas is generally a great resort of land shells.

5.—Streptaxis Watsoni, *n. s.*

Testa subumbilicata, compresse ovata, corneo-albida, nitida, superne transverse arcuato-striata, infra obsolete striatula, interdum ad ultimum anfractum lineis albidis versus suturam cincta; spira fere plana; sutura impressa; anfr. 6 convexiusculi, 2 ultimi e axi deviantes, ultimus rotundatus; apertura obliqua, elongato-lunaris, juxta anfr. penultimum acute retro sinuata, margine basali paulo arcuata; perist. reflexum, subincrassatum, albidum, tridentatum, singulis dentibus depressionibus pone peristoma externe correspondentibus; dentes 2 lamelliformes margine dextro, 1 columellari quasi basali; marginibus peristomatis callo, duas lamellas approximatas juxta suturam gerente, junctis.

Diam. maj., ...	$6\frac{1}{2}$ m. m.
Ditto min.	$4\frac{1}{2}$ ditto.
Alt.	3 ditto.

* In common probably with every other operculated Indian land shell except *Otopoma clausum*, Sow, and perhaps the two species of *Pomatias* described by Mr. Benson from the Himalaya and Khasi Hills.

Hab. in sylvis, præsertim prope arborum radices, ad apices montium "Nilgiri." Var. est, peristomate quinque dentato, dente uno minimo versus sinum aperturæ, tribus normalibus, uno minuto juxta umbilicum; dente ad marginem columellarem alteris latiore, quæ prope "Avalanche," ad pedem montium "Koondah" habitat.

This species appears to be more abundant than the previously described form, *Str. Perrotteti*,* Petit, from which it differs in its much smaller size, and despite this, in the greater development of its teeth, and also in the presence of two lamellæ instead of one on the callus joining the margins of the peristome. It appears to inhabit only the more southerly portions of the hills, but our researches have not been sufficiently extensive to render this a certainty. *Str. Perrotteti* occurred at Neddiwuttom, and on the hills N. of Ootacamund; *Str. Watsoni* we found S. of Ootacamund, and the variety at the base of the Koondahs. Both were obtained at an elevation of 6000 to 7000 feet. Although the variety differs slightly in the teeth, in the presence, viz. of two teeth which are absent in the normal form, these additional projections are so very minute that they might easily become obsolete, and probably additional specimens might shew a complete gradition, while the shells are so exactly similar in every other detail of form, that we have no hesitation in pronouncing them identical.

Explanation of figures.

1.—Opisthostoma Nilgiricum. Natural size.

2, 3, 4.—The same magnified 90 diameters (900 times).

5.—Scalariform costulation further enlarged.

* Or is this Petit's original species and that described by Pfeiffer distinct? In that case the names may be exchanged.